

ANSWER KEY

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SECOND YEAR HIGHER SECONDARY EXAMINATION MARCH 2022

PART-I/H/III

SUBJECT: STATISTICS

CODE NO: SY 32

VERSION: _____

60 SCORES

2 HOURS

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
1		(a) 0	1	1
2		(b) 1	1	1
3		(d) Walter A. Schewhart	1	1
4		(c) $E(x) = 4$ and $V(x) = 4$	1	1
5.		(a) 1	1	1
6.		(d) Sampling	1	1
7.		(b) 15, 15	1	1
8		(d) 124.9	1	1
9		(c) 1.75	1	1
10.		$3x^2 + 1$	1	1
11.		(d) 16	1	1
12.		(b) 12	1	1
13.		$Z_1 = 1.44$	1	1
14		(i) - (d), (ii) - (c), (iii) - (b), (iv) - (a)	$\frac{1}{2} \times 4$	2
15.		$UCL = \bar{\bar{x}} + A_2 \bar{R} = 16.2 + 0.577 \times 7.4 = 20.47$ $LCL = \bar{\bar{x}} - A_2 \bar{R} = 16.2 - 0.577 \times 7.4 = 11.93$ [If $CL = \bar{\bar{x}} = 16.2$ ^{only} , give 1 score]	$\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$	2.
16	(a)	Type I error - definition	1	2
	(b)	Type II error - definition	1	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
17		$y - \bar{y} = b_{yx} (x - \bar{x})$ $y - 27 = -1.5 (x - 53)$ When $x = 60$, $y - 27 = -1.5 (60 - 53)$ $y = 16.5$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	2
18		Point estimation - Definition/ Example / Explanation Interval estimation - Definition/ Example / Explanation	1 1	2
19.		$Z = \frac{x - \mu}{\sigma} = \frac{x - 68}{\sigma} \sim N(0,1)$ $P(X > 72) = P\left(Z > \frac{72 - 68}{\sigma}\right) = 0.1587$ $\frac{4}{\sigma} = 1$ $\sigma = 4$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	2
20		Solving the equations $\bar{x} = 1, \bar{y} = 2$	1 $\frac{1}{2} + \frac{1}{2}$	2
21	(a)	$\int 8 dx = 8x + C / 8x$	1	3
	(b)	$\int_0^1 (x+1) dx = \left[\frac{x^2}{2} + x \right]_0^1$ $= \left(\frac{1}{2} + 1 \right) - (0)$ $= 1.5$	1 $\frac{1}{2}$ $\frac{1}{2}$	
22		$\mu = 50, \sigma = 10$ $Z = \frac{x - \mu}{\sigma} = \frac{x - 50}{10} \sim N(0,1)$ $P(X < 70) = P\left(Z < \frac{70 - 50}{10}\right) = P(Z < 2)$ $= 0.5 + 0.4772 = 0.9772$	$\frac{1}{2}$ $\frac{1}{2}$ 1 1	3

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score																												
25.		<table border="1"> <thead> <tr> <th>R_1</th> <th>R_2</th> <th>$d=R_1-R_2$</th> <th>d^2</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>3</td> <td>1</td> <td>1</td> </tr> <tr> <td>2.5</td> <td>4</td> <td>-1.5</td> <td>2.25</td> </tr> <tr> <td>5</td> <td>1</td> <td>4</td> <td>16</td> </tr> <tr> <td>1</td> <td>5</td> <td>-4</td> <td>16</td> </tr> <tr> <td>2.5</td> <td>2</td> <td>0.5</td> <td>0.25</td> </tr> <tr> <td></td> <td></td> <td></td> <td>35.5</td> </tr> </tbody> </table> [Tied ranks need not be considered] $CF = \sum \frac{m^3 - m}{12} = \frac{2^3 - 2}{12} = 0.5$ $S = 1 - \frac{6(\sum d^2 + CF)}{n^3 - n}$ $= 1 - \frac{6(35.5 + 0.5)}{5^3 - 5} = -0.8$	R_1	R_2	$d=R_1-R_2$	d^2	4	3	1	1	2.5	4	-1.5	2.25	5	1	4	16	1	5	-4	16	2.5	2	0.5	0.25				35.5	1½ ½ ½	3
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26.		$F(x) = P(X \leq x) = \int_{-\infty}^x f(x) dx$ $= \begin{cases} 0, & x < 0 \\ x^2, & 0 < x < 1 \\ 1, & x \geq 1 \end{cases}$	2 1	3																												
27.		$R'(x) = 22 - 2x$ $R''(x) = -2$ $R'(x) = 0 \Rightarrow x = 11$ Maximum value at $x=11 = 121$	1 ½ 1 ½	3																												

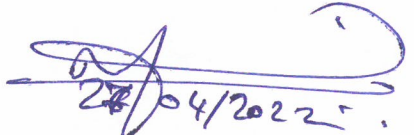
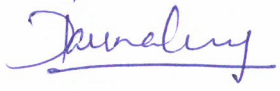
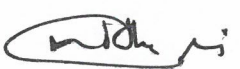
Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
28.		$b_{xy} = 1.09$ [using any relevent formula) $x - \bar{x} = b_{xy} (y - \bar{y})$ $x - 6.14 = 1.09 (y - 4)$	$2\frac{1}{2}$ 1 $\frac{1}{2}$	4.
29.	(a) $P(1 \leq x \leq 2) = \frac{1}{6} + \frac{2}{6} = \frac{3}{6} = 0.5$ (b) $E(x) = \sum x P(x)$ $= 1 \times \frac{1}{6} + 2 \times \frac{2}{6} + 3 \times \frac{3}{6} = \frac{14}{6} = 2.33.$ (c) $E(x^2) = \sum x^2 P(x) = 6$ $V(x) = E(x^2) - (E(x))^2$ $= 6 - (2.33)^2 = 0.5711$ $[\text{if } E(x) = \frac{14}{6}, \quad V(x) = 6 - (\frac{14}{6})^2 = 0.55]$	1 $\frac{1}{2}$ $\frac{1}{2}$ 1 $\frac{1}{2}$ $\frac{1}{2}$	4.	
30.	(a) 4 conditions $(4 \times \frac{1}{2} = 2)$ (b) $np = 6, \quad npq = 3.6$ $q = \frac{npq}{np} = \frac{3.6}{6} = 0.6$ $p = 1 - q = 1 - 0.6 = 0.4$	2 $\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	4.	
31	(a) Assignable factors — Definition / Examples/ Explanation	1		

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Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score																								
	(b)	<table><tr><th>Source</th><th>df</th><th>SS</th><th>MSS</th><th>F</th><th>F_{0.05}</th></tr><tr><td>Between</td><td><u>3</u></td><td>18</td><td><u>6</u></td><td>1.2</td><td>4.07</td></tr><tr><td>Within</td><td>8</td><td><u>40</u></td><td>5</td><td></td><td></td></tr><tr><td>Total</td><td>11</td><td><u>58</u></td><td></td><td></td><td></td></tr></table> F > F_α F < F_α, Accept H₀	Source	df	SS	MSS	F	F _{0.05}	Between	<u>3</u>	18	<u>6</u>	1.2	4.07	Within	8	<u>40</u>	5			Total	11	<u>58</u>				4 × $\frac{1}{2}$ = 2 1	4.
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32.	(a)	Identification procedure Regression line of Y on X - y - x = 5 Regression line of X on Y - 16x = 9y - 94	1 $\frac{1}{2}$ $\frac{1}{2}$																									
	(b)	b _{yx} = 1, b _{xy} = $\frac{9}{16}$	$\frac{1}{2}$ + $\frac{1}{2}$	4.																								
	(c)	r = ± $\sqrt{b_{yx} \times b_{xy}}$ = $\pm \frac{3}{4}$	$\frac{1}{2}$ + $\frac{1}{2}$																									
33.		Expected frequencies - 24.8, 15.2, 37.2, 22.8 $\chi^2 = \sum \frac{(O - E)^2}{E} = 1.81$	4 × $\frac{1}{2}$ = 2 1 + 1	4.																								
34		$\sum x = 46, \sum y = 35, \sum xy = 320,$ $\sum x^2 = 474, \sum y^2 = 265$ $r = \frac{n \sum xy - \sum x \times \sum y}{\sqrt{n \sum x^2 - (\sum x)^2} \times \sqrt{n \sum y^2 - (\sum y)^2}}$ $= \frac{5 \times 320 - 46 \times 35}{\sqrt{5 \times 474 - 46^2} \times \sqrt{5 \times 265 - 35^2}}$	2 $\frac{1}{2}$ 1 1																									

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score																																				
		$= \frac{-10}{\sqrt{254} \times \sqrt{100}}$ $= -0.063$ (Cov(x,y) = 0.4, $\sigma_x = 3.19$, $\sigma_y = 2$, $r = 0.063$)	1 $\frac{1}{2}$	6.																																				
35	(a)	<table border="1"> <thead> <tr> <th>P₀</th> <th>P₁</th> <th>$I = \frac{P_1}{P_0} \times 100$</th> </tr> </thead> <tbody> <tr> <td>44</td> <td>48</td> <td>109.1</td> </tr> <tr> <td>38</td> <td>40</td> <td>105.3</td> </tr> <tr> <td>48</td> <td>54</td> <td>112.5</td> </tr> <tr> <td></td> <td></td> <td>326.9</td> </tr> </tbody> </table> Simple AM Index No = $\frac{\sum I}{n}$ $= \frac{326.9}{3} = 108.97$	P ₀	P ₁	$I = \frac{P_1}{P_0} \times 100$	44	48	109.1	38	40	105.3	48	54	112.5			326.9	1 $\frac{1}{2}$ $\frac{1}{2}$																						
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3b.	(a)	$V(T_1) = V(2x_1 - 2x_2 + x_3)$ $= 4\sigma^2 + 4\sigma^2 + \sigma^2 = 9\sigma^2$ $V(T_2) = V(3x_1 - x_2 - x_3)$ $= 9\sigma^2 + \sigma^2 + \sigma^2 = 11\sigma^2$ $V(T_1) < V(T_2)$ $\therefore T_1 \text{ is more efficient than } T_2$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	
	(b)	$H_0: \mu = 50, \quad H_1: \mu \neq 50$ $n = 144, \quad s = 20, \quad \bar{x} = 55, \quad \alpha = 0.05$ $Z = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$ $= \frac{55 - 50}{20/\sqrt{144}} = 3$ $ Z = 3 > Z_{\alpha/2} \quad \text{Reject } H_0$	$\frac{1}{2}$ $\frac{1}{2}$ 1 $\frac{1}{2}$ $\frac{1}{2}$	6

1. Dr. MANOJ.K  28/04/2022.
2. Dr. Sajish kumar.m, m.v.k.m.H.S.S. Chithilancherry 
3. Dr. Beju. G.V , Govt VHSS Vithura, 
4. Darsana kumary.D, Nis 1883 Chelbennoor, Kollam 
5. Smitha. M.S. SNHSS, Poocheekal 
6. LATHA. S.G, SMU NSS 1483 Kallalee Kottayam 
7. Seby Jose.P m.s.m.H.S.S. kallinga/paramba 